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(54) METHOD FOR IMPROVING THE FITTING OF HEARING AIDS AND DEVICE FOR IMPLEMENTING THE METHOD

VERFAHREN ZUR VERBESSERUNG DES PASSENS VON HÖRGERÄTEN SOWIE GERÄT ZUR IMPLEMENTIERUNG DES VERFAHRENS

PROCEDE DESTINE A AMELIORER LE REGLAGE D'APPAREILS AUDITIFS ET DISPOSITIF DE MISE EN OEUVRE DUDIT PROCEDE

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Description

FIELD OF THE INVENTION

[0001] The invention relates to the optimal adjustment of the signal processing in a hearing aid for the range of environments in which it is intended for use. More specifically the invention relates to a method for individual fitting of a hearing aid and a device adapted for facilitating this individual fitting.

BACKGROUND OF THE INVENTION

[0002] Today it is normal to adjust the signal processing parameters of a hearing aid for the individual patient by means of audiometric data defining the patient's hearing loss in a predefined frequency range, combined with a prescriptive amplification rationale which has proven suitable for the given patient's type of hearing loss. WO-A-9 919 779 describes such a method. It is widely accepted that such a fitting will in most cases only give a rough estimate of the optimum hearing aid setting for the patient. It is therefore common practice subsequently to carry out a fine-tuning of the hearing aid's signal processing parameters in order to improve the sound quality as received by the patient. Such fine-tuning is normally based on subjective opinions expressed by the patient after using the hearing aid for some time. In this way it is possible to account in a rough way for the actual circumstances in which the patient spends time using the hearing aid. This approach relies on the dispenser to interpret the patient's description of specific listening situations, assess what acoustical or other features of those situations are causing difficulties, and specify appropriate alterations to the signal processing parameters of the hearing aid.

[0003] The objective of the present invention is to provide a method for fitting a hearing aid that is less time-consuming and more accurate than the previously known fitting methods.

[0004] A further objective of the present invention is to provide a device, which is suitable for use in a hearing aid fitting process according to the invention.

SUMMARY OF THE INVENTION

[0005] According to the invention the objective relating to the method is achieved by the method as defined in claim 1.

[0006] By collecting measurement data describing the environments in which the hearing aid is to be used, prior to the actual use of the hearing aid, it is possible to obtain a more reliable estimate of the actual needs of the hearing aid user. By specifying the alterations to the processing on the basis of (a) knowledge about relations between features of listening environments and optimal signal processing for those environments, combined with (b) actual measurements of features of the patient's listening environments a better approach to the fitting has been achieved and hence a less time-consuming fitting procedure is achievable.

[0007] Preferred embodiments are set forth in claims 2- 4.

[0008] The embodiment in claim 2 will allow collection of data independent of the hearing aid use. This could for example be through use of a device adapted for this purpose, whilst the customised parts of the hearing aid are being manufactured, which often takes several days.

[0009] The embodiment of claim 3 provides the possibility of giving certain data a certain weight, hereby achieving a more correct fitting.

[0010] The embodiment of claim 4 provides the possibility of performing the data collection during normal hearing aid use and in a programming sequence preceding a future use performing a reprogramming based on the collected data.

[0011] According to the invention the objective relating to the device is achieved by the device as defined in claim 5.

[0012] By providing means for collecting and storing the data prior to the actual use of the hearing aid it is possible to sample long term statistical values and hence obtain a more reliable estimate of the actual needs of the hearing aid user. A better estimate for the initial fitting is achieved. This means that fewer fine tuning sessions are required and hence a less time-consuming fitting procedure is likewise achievable by use of such device.

[0013] Preferred embodiments are set forth in claims 6-9.

[0014] By the embodiment of claim 6 the device comprises the normal hearing aid components, i.e. the device is a hearing aid featuring the data collection ability.

[0015] By the embodiment in claim 7 the microphone is used for both audio data collection and the sound collection. A further possibility comprises providing a further microphone. According to claim 8 a switch may be provided for selecting different modes of the device.

[0016] The embodiment of claim 9 features a number of further sensors. The data collected by these sensors may likewise be used in the fitting procedure.

[0017] The invention will be described in more detail in the following description of the preferred embodiment with reference to the drawings.

DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a diagram showing the invention as an element of a dispenser-controlled fitting procedure;

FIG. 2 is a diagram showing the invention as an integrated part of an adaptive hearing aid.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] The invention may be implemented in a number of different manners, the two most preferred being as an element of a dispenser-controlled fitting procedure and as an integrated part of an adaptive hearing aid suitable for use in an adaptive fitting process. These are described below and are shown schematically in block diagrams of the drawings FIG. 1 and FIG. 2.

[0020] Referring now to FIG. 1 the invention implemented as a part of a dispenser-controlled procedure is explained. Typically, a hearing aid client does not receive a hearing aid at the first visit to the dispenser, but at a later date (for example after an earmould has been manufactured from an ear impression). With the present invention, instead of going home empty-handed to wait for the earmould to be produced, the client is given a portable or wearable device, which contains one or more physical sensors, some signal processing and a datalogger, and optionally includes a means for registering time intervals which the client considers to represent environments of particular importance.

Whilst the client wears this device, it collects data on the environments experienced by the client. These data are used to improve the prescription of the final hearing aid when the client returns to the dispenser. Data to collect would very likely include levels and spectral distributions of sound across time, but need not be restricted to acoustical quantities if others are found to correlate with optimal hearing aid settings; possible candidates include but are not restricted to ambient or body temperature, light levels, amount of movement, cardiovascular activity, psychological stress.

[0021] Referring now to FIG. 2 the invention implemented as a part of a hearing aid is explained. At the initial fitting session, the client's hearing aid is adjusted according to some standard prescriptive approach, or indeed by application of the method embodied above. Thereafter with the present invention, the hearing aid itself acts as a data collector, and includes means for using the data collected to generate alterations to the initial settings provided by the dispenser. These alterations might come into play automatically or when activated by the client. Such an embodiment would make it possible for the hearing aid itself to adjust its signal processing parameters as a consequence of for example altered social behavior resulting from hearing aid use or altered relative importance of different environments for the user.

[0022] As an example of the invention embodied as an element of a dispenser-controlled fitting procedure the following could be the case: A hearing impaired person has been provided with a measuring and recording device for collecting statistical data from the environments, which have importance for that person. The statistical data are afterwards, that means after a few days recording, analyzed by the hearing aid dispenser. This analysis may be done manually or may be done by a computer according to a program adapted for such analysis. The results of the analysis are afterwards used by the dispenser for selecting the correct initial adjustment of the hearing aid, which most often involves the selection of an amplification rationale that suits the person's hearing loss and afterwards tuning the parameters according to the actual needs indicated by the analysis of the environmental recording. For example, A person whose environments contain unusually high levels of high frequency components will need a lower high frequency gain.

Claims

1. A method for fitting a hearing aid to the needs of a hearing aid user, the method comprising: collecting statistical data **characterising** physical or psychological properties of environments in which use of the hearing aid is desired, where the statistical data are collected prior to the wearer's first or current period of use of the hearing aid.and utilising the statistical data **characterising** physical or psychological properties of environments for the setting of the signal processing parameters in the hearing aid.

2. A method according to claim 1, where the statistical data is collected by a device adapted for this purpose and where the data, either as sampled or transformed, afterwards are utilized to set the hearing aid processing parameters, for example in a software program.

3. A method according to claim 1, where the statistical data relating to physical characteristics of environments are coupled with data relating to the significance of these same environments to the user.

4. A device according to claim 1, 2 or 3, where statistics of the input data are accumulated at the same time as an acoustical input signal is processed and output to the wearer's ear.

5. A device for use in carrying out the method according to any of the claims 1-3, the device comprising: means for collecting statistical data **characterising** physical or psychological properties of environments in which use of the hearing aid is desired, means for storage of the statistical data and means for transmitting the statistical data to a processor for transforming the data in order to use these data **characterising** physical or psychological properties of environments for setting the hearing aid processing parameters.

6. A device according to claim 5, where the device comprises a microphone for collecting acoustic signals and transforming these to electrical signals,

processing means for processing the electrical signals and output means for generating an acoustical output signal from the processed electrical signals.

7. A device according to claim 6, where the microphone is also used for collecting statistical data **characterising** acoustical properties of environments in which use of the hearing aid is desired.

8. A device according to claim 6, where a switch is provided for selecting an input mode for sampling environmental data or an operation mode where the normal hearing aid function is activated.

9. A device according to any of the claims 6 to 8, where further sensors are provided for detecting non-audio statistical values, e.g. light, body temperature, movement, cardiovascular activity, psychological stress.

Patentansprüche

1. Verfahren zum Anpassen einer Hörhilfe an die Bedürnisse eines Benutzers der Hörhilfe, wobei das Verfahren umfaßt:

   Erheben statistischer Daten, welche physische oder psychologische Eigenschaften der Umgebung kennzeichnen, in welcher die Anwendung des Hörgeräts gewünscht ist, wobei die statistischen Daten vor der ersten oder aktuellen Benutzungsperiode der Hörhilfe durch den Träger erhoben werden; und

   Verwenden der statistischen Daten, welche physische oder psychologische Eigenschaften der Umgebung kennzeichnen, zum Einstellen der Parameter der Signalverarbeitung in der Hörhilfe.

2. Verfahren nach Anspruch 1, wobei die statistischen Daten von einer zu diesen Zwecken angepassten Vorrichtung erhoben werden, und wobei die Daten, entweder gesammelt oder umwandelt anschließend zum Einstellen der Verarbeitungsparameter der Hörhilfe beispielsweise in einem Software-Programm verwendet werden.

3. Verfahren nach Anspruch 1, wobei die statistischen Daten, welche sich auf physikalische Eigenschaften der Umgebung beziehen, mit Daten in Bezug gebracht werden, welche sich auf die Signifikanz derselben Umgebung des Benutzers beziehen.

4. Vorrichtung nach Anspruch 1, 2 oder 3, wobei die Statistiken der Input-Daten gleichzeitig mit der Verarbeitung und Ausgabe des akustischen Inputsignals an das Ohr des Trägers akkumuliert werden.

5. Vorrichtung zur Verwendung beim Ausführen des Verfahrens nach einem der Ansprüche 1 bis 3, wobei die Vorrichtung aufweist:

   eine Einrichtung zum Erheben von statistischen Daten, welche physikalische oder psychologische Eigenschaften der Umgebung, in welchen die Verwendung der Hörhilfe gewünscht ist, kennzeichnen;

   eine Einrichtung zum Speichern der statistischen Daten; und

   eine Einrichtung zum Übertragen der statistischen Daten an einen Prozessor zur Umwandlung der Daten zur Verwendung dieser Daten, welche physikalische oder psychologische Eigeschaften der Umgebung kennezeichnen, bei der Einstellung der Arbeitsparameter der Hörhilfe.

6. Vorrichtung nach Anspruch 5, wobei die Vorrichtung aufweist:

   ein Mikrophon zum Aufnehmen von akustischen Signalen und deren Umwandelung zu elektrischen Signalen;

   eine Verarbeitungseinrichtung zum Verarbeiten der elektrischen Signale; und

   eine Ausgabeeinrichtung zum Erzeugen eines akustischen Ausgangssignals aus den verarbeiteten elektrischen Signalen.

7. Vorrichtung nach Anspruch 6, wobei das Mikrophon zum Erheben von statistischen Daten verwendet wird, welche akustische Eigenschaften jener Umgebung kennzeichnen, in welcher die Hörhilfes zu verwenden gewünscht wird.

8. Vorrichtung nach Anspruch 6, wobei ein Schalter vorgesehen ist zum Auswählen eines Input-Modus zum Aufnehmen von Umgebungsdaten oder eines Betriebmodus, in welchem die normale Funktion der Hörhilfe aktiviert ist.

9. Vorrichtung nach einem der Ansprüche von 6 bis 8, wobei weitere Sensoren zum Erfassen von statistischen, nicht-akustischen Werten wie z. B. Licht, Körpertemperatur, Bewegung, kardiovaskuläre Aktivität, psychologischer Stress, vorgesehen sind.

Revendications

1. Procédé pour adapter une aide auditive aux besoins d'un utilisateur d'aide auditive, le procédé comprenant : la collecte de données statistiques caractérisant les propriétés physiques ou psychologiques des environnements dans lesquels on souhaite utiliser l'aide auditive, les données statistiques étant collectées avant la période initiale ou actuelle d'utilisation de l'aide auditive par le porteur, et l'utilisation des données statistiques caractérisant les propriétés physiques ou psychologiques des environnements pour régler les paramètres de traitement de signaux dans l'aide auditive.

2. Procédé selon la revendication 1, dans lequel les données statistiques sont collectées par un dispositif adapté à cet effet et dans lequel les données, soit telles qu'elles ont été échantillonnées, soit transformées, sont utilisées par la suite pour régler les paramètres de traitement de l'aide auditive, par exemple dans un programme de logiciel.

3. Procédé selon la revendication 1, dans lequel les données statistiques relatives à des caractéristiques physiques des environnements sont couplées avec des données relatives à la signification que ces mêmes environnements ont pour l'utilisateur.

4. Procédé selon la revendication 1, 2 ou 3, dans lequel les statistiques des données d'entrée sont accumulées en même temps qu'un signal acoustique d'entrée est traité et sorti sur l'oreille de l'utilisateur.

5. Dispositif destiné à être utilisé dans la mise en oeuvre du procédé selon une quelconque des revendications 1-3, le dispositif comprenant : des moyens pour collecter des données statistiques caractérisant les propriétés physiques ou psychologiques des environnements dans lesquels on souhaite utiliser l'aide auditive, des moyens pour stocker les données statistiques et des moyens pour transmettre les données statistiques à un processeur destiné à transformer les données de manière à utiliser ces données caractérisant des propriétés physiques ou psychologiques des environnements pour régler les paramètres de traitement de l'aide auditive.

6. Dispositif selon la revendication 5, dans lequel le dispositif comprend un microphone pour collecter des signaux acoustiques et les transformer en signaux électriques, des moyens de traitement pour traiter les signaux électriques et des moyens de sortie pour générer un signal de sortie acoustique à partir des signaux électriques traités.

7. Dispositif selon la revendication 6, dans lequel le microphone est aussi utilisé pour collecter des données statistiques caractérisant des propriétés acoustiques des environnements dans lesquels on souhaite utiliser l'aide auditive.

8. Dispositif selon la revendication 6, dans lequel un commutateur est prévu pour sélectionner un mode entrée pour échantillonner des données environnementales ou un mode fonctionnement dans lequel la fonction aide auditive normale est activée.

9. Dispositif selon une quelconque des revendications 6 à 8, dans lequel d'autres capteurs sont prévus pour détecter des valeurs statistiques non audio, par exemple, la lumière, la température corporelle, le mouvement, l'activité cardiovasculaire, le stress psychologique.

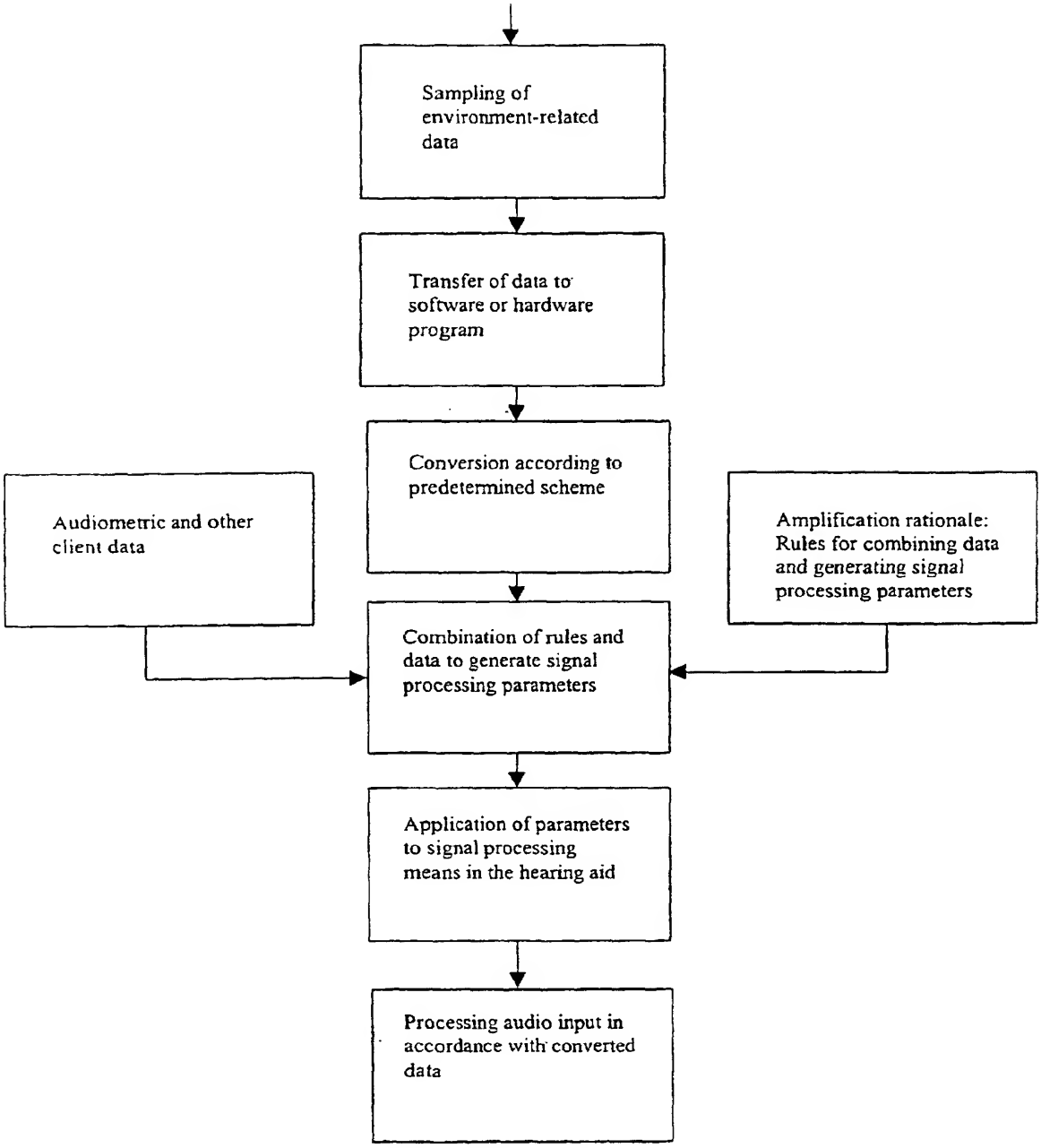
Sampling of environment-related data
Transfer of data to software or hardware program
Conversion according to predetermined scheme
Audiometric and other client data
Amplification rationale: Rules for combining data and generating signal processing parameters
Combination of rules and data to generate signal processing parameters
Application of parameters to signal processing means in the hearing aid
Processing audio input in accordance with converted data

FIG. 1

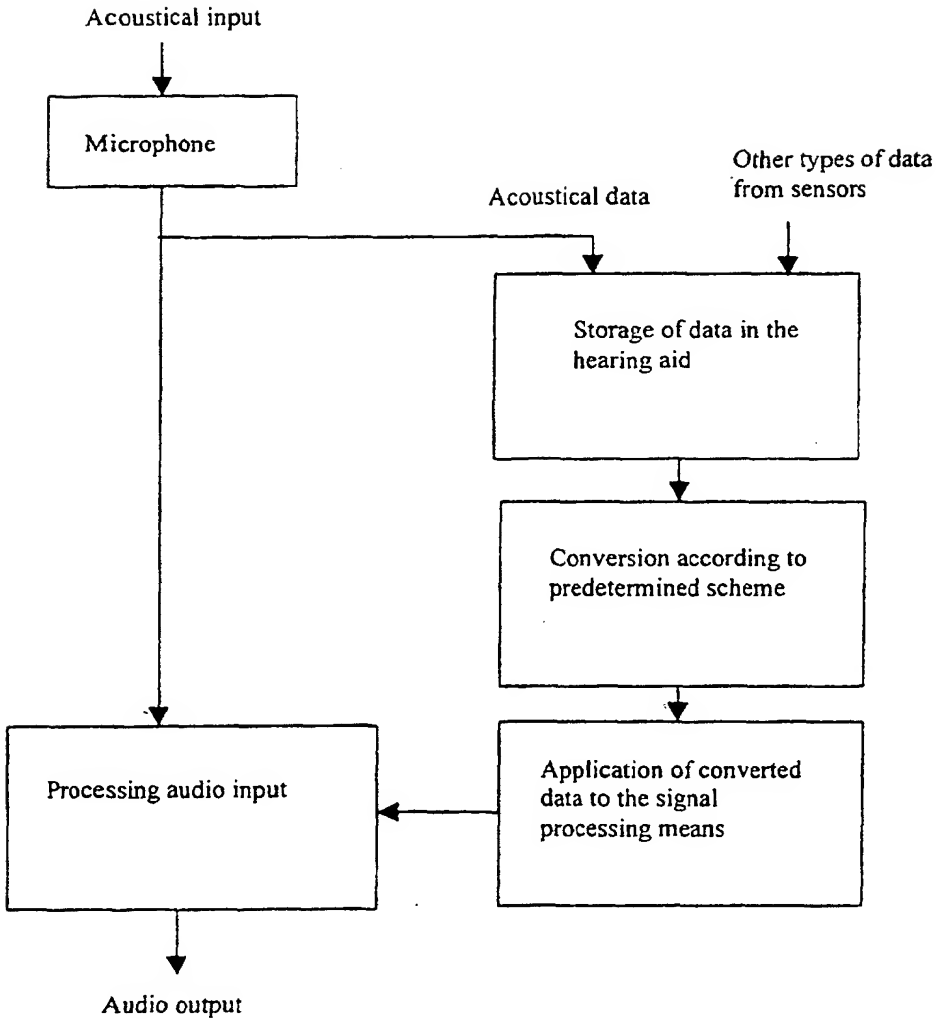
Acoustical input
Microphone
Acoustical data
Other types of data from sensors
Storage of data in the hearing aid
Conversion according to predetermined scheme
Application of converted data to the signal processing means
Processing audio input
Audio output

FIG. 2